

REMARKS

By this Amendment, claims 26, 29, 32 and 35 are amended, and claims 54-55 are added. Claims 27-28, 30-31, 33-34 and 36-53 remain in the application. Thus, claims 26-55 are active in the application. Reexamination and reconsideration of the application are respectfully requested.

On page 3 of the Office Action, claims 26-29, 31-35, 37-38, 40-42, 44-46, 48-50 and 52-53 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Korenaga et al. (U.S. Patent Application Publication No. 2003/0118294, hereinafter “Korenaga”).

Without intending to acquiesce to this rejection, independent claims 26, 29, 32 and 35 have each been amended in order to more clearly illustrate the marked differences between the present invention and the applied references. Accordingly, the Applicant respectfully submits that the present invention is patentable over the applied references for the following reasons.

The present invention provides a novel improvement over conventional subassemblies and optical modules in that the present invention adopts a unique lens element which includes a lens portion that is formed at a surface of an optical substrate, and a projection portion that comes into contact with a groove of the supporting substrate when the lens element is mounted.

The lens element of the present invention is adopted instead of the conventional lenses such as a ball lens with a significant external diameter so as to provide a new and improved subassembly and optical module that enable highly accurate positioning and miniaturization.

In particular, the subassembly and optical module of the present invention provide that a lens element 130 includes a lens portion 132 that is formed at a surface of an optical substrate of the lens element 130, and a projection portion 136 that comes in contact with a groove 112 at the supporting substrate 110 when the lens element 130 is mounted in the groove 112 of the supporting substrate 110 (see line 27 on page 10 to line 1 on page 11 of the substitute specification and Figure 1, for example).

The projection portion 136 is located on the bottom surface of the lens portion 132 and the surface of the projection portion 136 follows the contour of the external surface of the lens portion 132. The shape of the projection portion 136 allows the

projection portion 136 to fit in the groove 112 of the supporting substrate 110 so that the lens element 130 can be mounted at the supporting substrate 110 while the projection portion 136 is set in contact with the groove 112 (see lines 14-27 on page 11 of the substitute specification and Figure 1, for example).

Accordingly, the present invention provides that the projection portion 136 of the lens element 130 supports an external edge of the lens portion 132 and is disposed between the groove 112 and the external edge of the lens portion 132 when the lens element 130 is mounted in the supporting substrate 110.

The projection portion 136 also allows for the lens element 130 to be positioned in the groove 112 along the X and Y directions of the optical axis of the lens element 130 (see line 27 on page 11 to line 2 on page 12 and lines 1-6 on page 13 of the substitute specification).

Accordingly, by including the projection portion in the lens element of the present invention, the subassembly and optical module of the present invention are enabled to obtain highly accurate positioning of the lens element.

Independent claims 26, 29, 32 and 35 recite the above-described features of the present invention.

In particular, the lens element of the subassembly of claim 26 and the lens element of the optical module of claim 29 are each recited as including a lens portion and a projection portion that comes in contact with the groove at the supporting substrate when the lens element is mounted. Furthermore, claims 26 and 29 each define that the projection portion supports an external edge of the lens portion and is disposed between the groove and the external edge of the lens portion when the lens element is mounted.

In addition, the first lens element of the subassembly of claim 32 and the first lens element of the optical module of claim 35 are each recited as including a first lens portion and a first projection portion that comes in contact with the first groove at the supporting substrate when the first lens element is mounted. Furthermore, claims 32 and 35 each define that the projection portion supports an external edge of the lens portion and is disposed between the groove and the external edge of the lens portion when the lens element is mounted.

In item 2 on page 2 of the Office Action and in line 19 on page 3 to line 2 on page 4 of the Office Action, the Examiner asserted that the first lens 85a and second lens 85b of Korenaga (see Figure 8) correspond to the lens elements recited in claims 26, 29, 32 and 35. However, the Applicant respectfully submits that the lens elements recited in claims 26, 29, 32 and 35 are structurally different from the first and second lenses 85a, 85b of Korenaga for the following reasons.

Korenaga discloses that a second guide groove 83a for positioning the first lens 85a and that a third guide groove 83b for positioning the second lens 85b are formed on the surface of an optical package substrate 81 (see paragraph [0142] and Figure 8). Korenaga also discloses that the first lens 85a abuts against the second guide groove 83a and that the second lens 85b abuts against the third guide groove 83b so that the optical axes of the first and second lenses 85a, 85b and an optical fiber 84 disposed between the first and second lenses 85a, 85b are aligned with each other (see paragraph [0142] and Figure 8).

Accordingly, the first and second lenses 85a, 85b disclosed in Korenaga clearly have external curved surfaces which abut against the first and second grooves 83a, 83b, respectively. In other words, the external surfaces of the cylindrical first and second lenses 85a, 85b come into direct contact with the first and second grooves 83a, 83b when the first and second lenses 85a, 85b are respectively mounted in the first and second grooves 83a, 83b.

Therefore, Korenaga clearly does not disclose or suggest that the first and second lenses 85a, 85b include a projection portion which supports an external edge of the lens portion of the first and second lenses 85a, 85b and which is disposed between the grooves 83a, 83b and the external edge of the lens portion when the first and second lenses 85a, 85b are mounted.

On the contrary, Korenaga discloses the external surfaces of the first and second lenses 85a, 85b directly come into contact with the grooves 83a, 83b when the first and second lenses 85a, 85b are mounted.

Accordingly, Korenaga clearly does not disclose or suggest a lens element including a lens portion and a projection portion that comes in contact with the groove at the supporting substrate when the lens element is mounted, where the projection portion

supports an external edge of the lens portion and is disposed between the groove and the external edge of the lens portion when the lens element is mounted, as recited in claims 26 and 29.

Similarly, Korenaga clearly does not disclose or suggest a first lens element including a first lens portion and a first projection portion that comes in contact with the first groove at the supporting substrate when the first lens element is mounted, where the projection portion supports an external edge of the lens portion and is disposed between the groove and the external edge of the lens portion when the lens element is mounted, as recited in claims 32 and 35.

Therefore, Korenaga clearly fails to disclose or suggest each and every limitation of claims 26, 29, 32 and 35.

As a result, the inventions of claims 26, 29, 32 and 35 are clearly patentable over Korenaga since Korenaga fails to disclose or suggest each and every limitation of claims 26, 29, 32 and 35.

On page 6 of the Office Action, dependent claims 30 and 36 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Korenaga in view of Yonemura (U.S. 6,843,609). Further, on page 6 of the Office Action, dependent claims 39, 43, 47 and 51 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Korenaga in view of Boudreau et al. (U.S. 5,420,953, hereinafter “Boudreau”).

As demonstrated above, Korenaga clearly fails to disclose or suggest the projection portion of the lens element recited in claims 26 and 29, and the first projection portion of the first lens element recited in claims 32 and 35.

However, similar to Korenaga, Yonemura and Boudreau also do not disclose or suggest the projection portion of the lens element recited in claims 26 and 29, and the first projection portion of the first lens element recited in claims 32 and 35.

Therefore, Yonemura and Boudreau do not cure the deficiencies of Korenaga for failing to disclose or suggest each and every limitation of claims 26, 29, 32 and 35.

Consequently, no obvious combination of Korenaga, Yonemura and Boudreau would result in the inventions of claims 26, 29, 32 and 35 since Korenaga, Yonemura and Boudreau, either individually or in combination, clearly fail to disclose or suggest each and every limitation of claims 26, 29, 32 and 35.

Furthermore, it is submitted that the clear distinctions discussed above are such that a person having ordinary skill in the art at the time the invention was made would not have been motivated to modify Korenaga, Yonemura and Boudreau in such a manner as to result in, or otherwise render obvious, the present invention as recited in claims 26, 29, 32 and 35.

Therefore, the Applicant respectfully submits that claims 26, 29, 32 and 35, as well as claims 27-28, 30-31, 33-34 and 36-55 which depend therefrom, are clearly allowable over the prior art as applied by the Examiner.

In view of the foregoing amendments and remarks, it is respectfully submitted that the present application is clearly in condition for allowance. An early notice thereof is respectfully solicited.


If, after reviewing this Amendment, the Examiner feels there are any issues remaining which must be resolved before the application can be passed to issue, the Examiner is respectfully requested to contact the undersigned by telephone in order to resolve such issues.

A fee and a Petition for a one-month Extension of Time are filed herewith pursuant to 37 CFR § 1.136(a).

Respectfully submitted,

Masahiro UEKAWA

By:


Jonathan R. Bowser
Registration No. 54,574
Attorney for Applicant

JRB/nrj
Washington, D.C. 20006-1021
Telephone (202) 721-8200
Facsimile (202) 721-8250
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